

Figure 4. Site 29671 Features 17 and 18 Plan Map

Feature 15 (GANDA #682) was originally identified by GANDA as having only a single excavated pit, but Robins, González & Peterson 2006 reported two pits at this feature. Two (2) excavated pits were identified during the current project in an approximately 7 x 4 m area. This cluster was located in the bottom of a natural 'a'a lava trench with high berms on either side that provide natural protection to this cluster. This feature falls within the area identified as Range 11T, and within the SDZ.

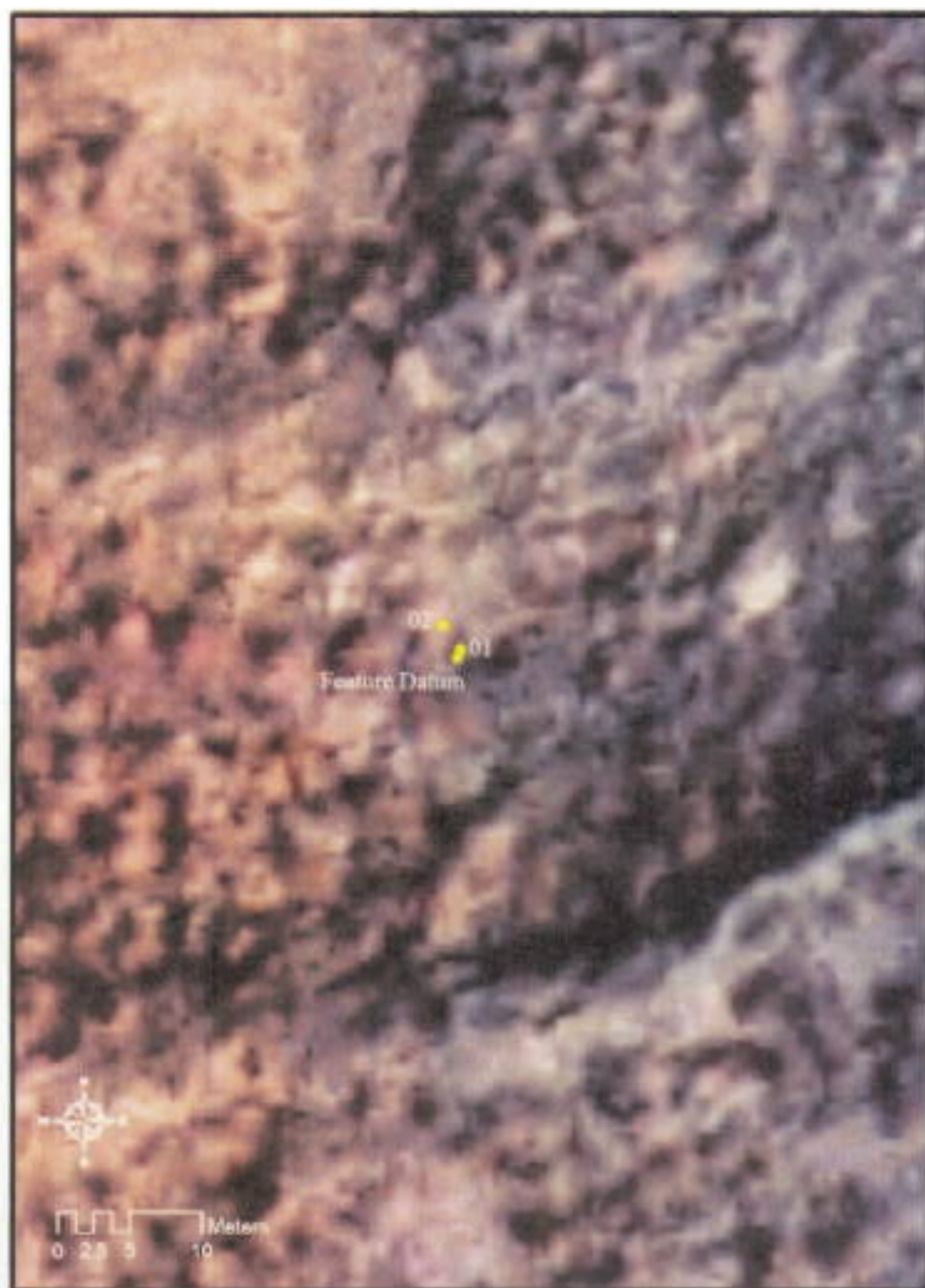


Figure 7. Site 23621 Features 15 Plan Map

Feature 8 (GANDA #678) is located behind, roughly south, of a large man-made berm. GANDA identified three pits in this cluster. Seven (7) excavated pits were identified by the current project at this location in two concentrations that extend over a 13 x 13 m area. This cluster is at a lower elevation than the berm, though the landscape around it is fairly open and flat. The pits are

on level horizontal ground surface. This feature falls within the area identified as Range 11T, and within the SDZ.

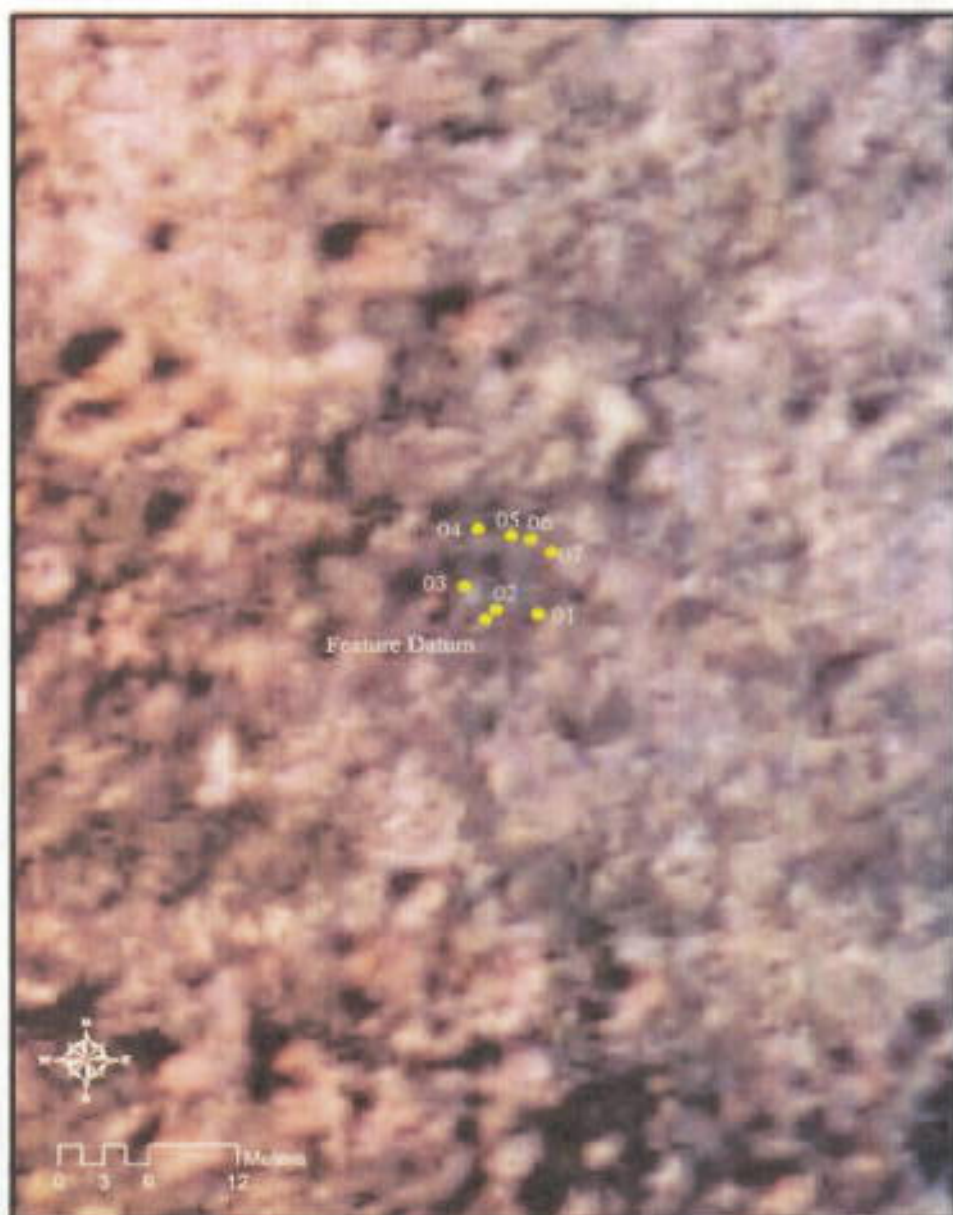


Figure 8. Site 23621 Feature 38 Plan Map

Feature 2 (GANDA #658) was identified by GANDA as including 10 or more excavated pits. The current project identified four (4) features close to Engineer Trail (a dirt road) extending over an area 19 x 11 m. The area is in a low spot, with the topography rising to the north. The



Figure 9. Site 23621 Feature 2 Plan Map

pāhoehoe is weathering badly and many of the features that were identified by GANDA appear to either be natural weathering or the result of a tank driving through the area. The rock pieces appear to have been crushed or collapsed in place. Few of the rock pieces have been moved out of place,

and none were turned over so that the bottom side faced up. Tank tracks were identified in this area, including scoring on remaining bedrock, and an old tank has been abandoned nearby. This feature lies within the SDZ.

Feature 3 (GANDA #659) was described by GANDA as including 5 or more pits. The current project identified fourteen (14) excavated pits over an 82 x 55 m area and a pile of rocks with a post standing upright from the center. The entire area consisted of undulating weathered pāhoehoe with a large amount of fountain grass and *naio* (*Myoporum sandwicense*) growing in the area, and a dispersed 'ōhi'a (*Metrosideros polymorpha*) forest is south and east of the area. The mound of rocks measured 1.5 by 1.2 m and was 0.6 m tall. The post measured 1.3 m from the base of the mound, and was located at the center apex of the mound. The post was made from a tree, as the top branched into two directions. The area also contained evidence of burning, with burned tree stumps and several burn concentration areas. The burning event did not appear to have been a controlled cultural event, and did not appear related to the excavated pits. The area is largely horizontal with no natural protective elements for the pits. Feature 3 falls within the boundaries of the SDZ.

Feature 10 (GANDA #679) was recorded by GANDA as consisting of 2 pits. Two (2) excavated pits were recorded at this location during the current project on a horizontal exposed surface measuring 10 x 3 m. There appear to be some natural ridges between this cluster and the firing points at 11 Tango. This feature is at the edge of the established boundaries of Range 11T and falls within the SDZ.

Feature 9 (GANDA #681) was documented by GANDA as a cluster of 3 excavated pits. The current project also recorded three (3) excavated pits at this location, one of which is very small. The pits extend over an area of about 9 x 4 m. Two of the pits appear to connect beneath the lava. The surface into which the pits are excavated slopes away from the firing points into a natural trench, and there is a natural 'a'ā berm to the northeast between this cluster and the firing points area. This feature is located outside of Range 11T and the SDZ.

Feature 12 (GANDA #677) was not relocated during the current project. Three or more excavated pits were reported in the GANDA field notes at this location, but only one was noted in the Robins & González 2006. The location was identified based upon the coordinates provided by GANDA, but no excavated pits were found at this location. There were some naturally collapsed lava tubes in the immediate area that might originally have been identified as this site. This site is also close to Feature 13 and any excavated pits from this site might have been incorporated into the latter site number. No GANDA site tag was located. This location is outside of Range 11T and the SDZ.



Figure 10 Site 23621 Feature 3 Plan Map



Figure 11. Site 23621 Feature 10 Plan Map

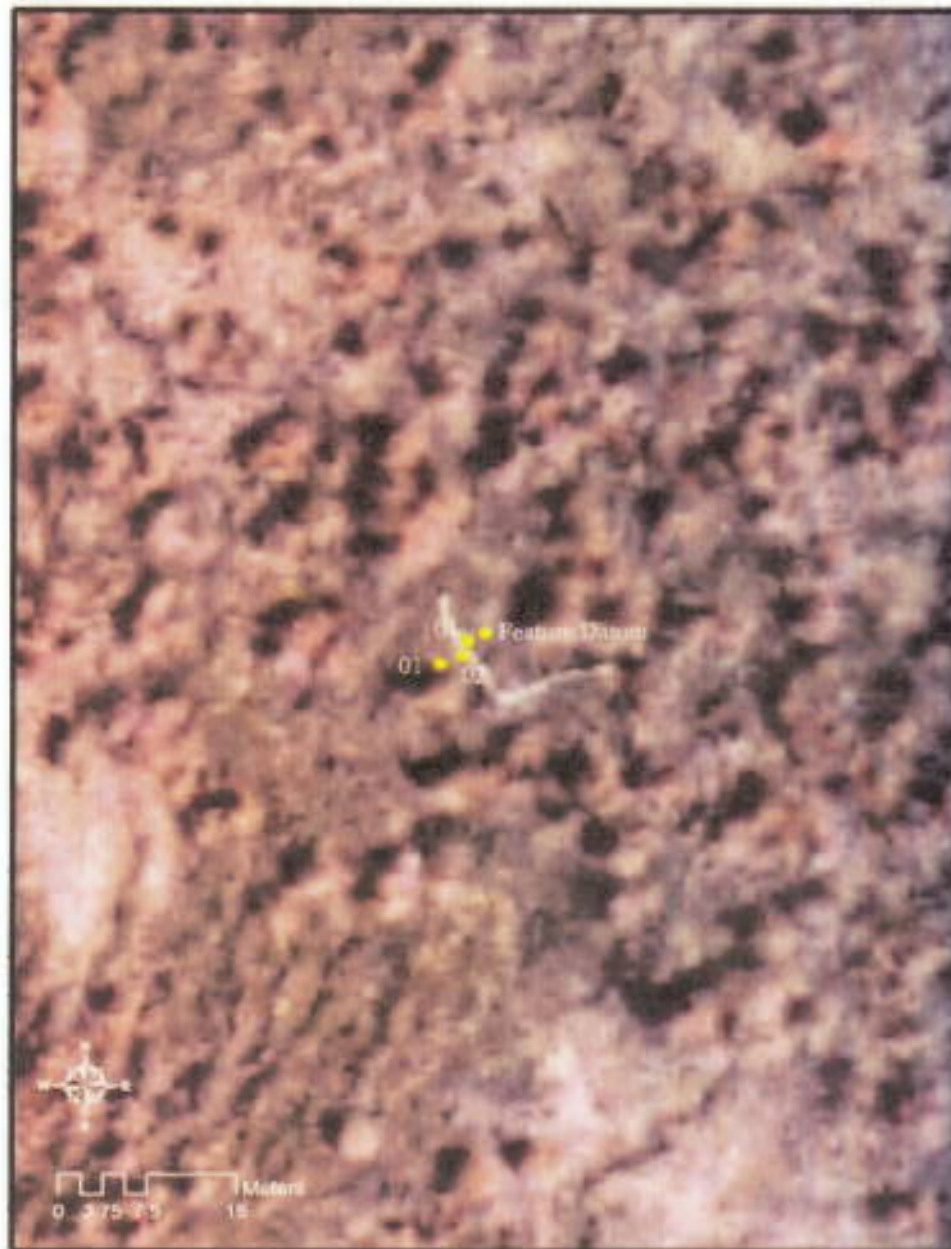


Figure 12. Site 23621 Feature 9 Plan Map

Feature 13 (GANDA #683) was recorded by GANDA as comprising 10 excavated pits. The current project identified nine (9) excavated pits that are found on both flat horizontal lava and areas that slope away from the proposed firing points. The pits extend over an area that measures 23 x 22 m. Line of sight to the fire points is poor from many of the features, and there is an 'a'ā lava ridge to the north-northwest of the location. The feature is outside of Range 11T and the SDZ.

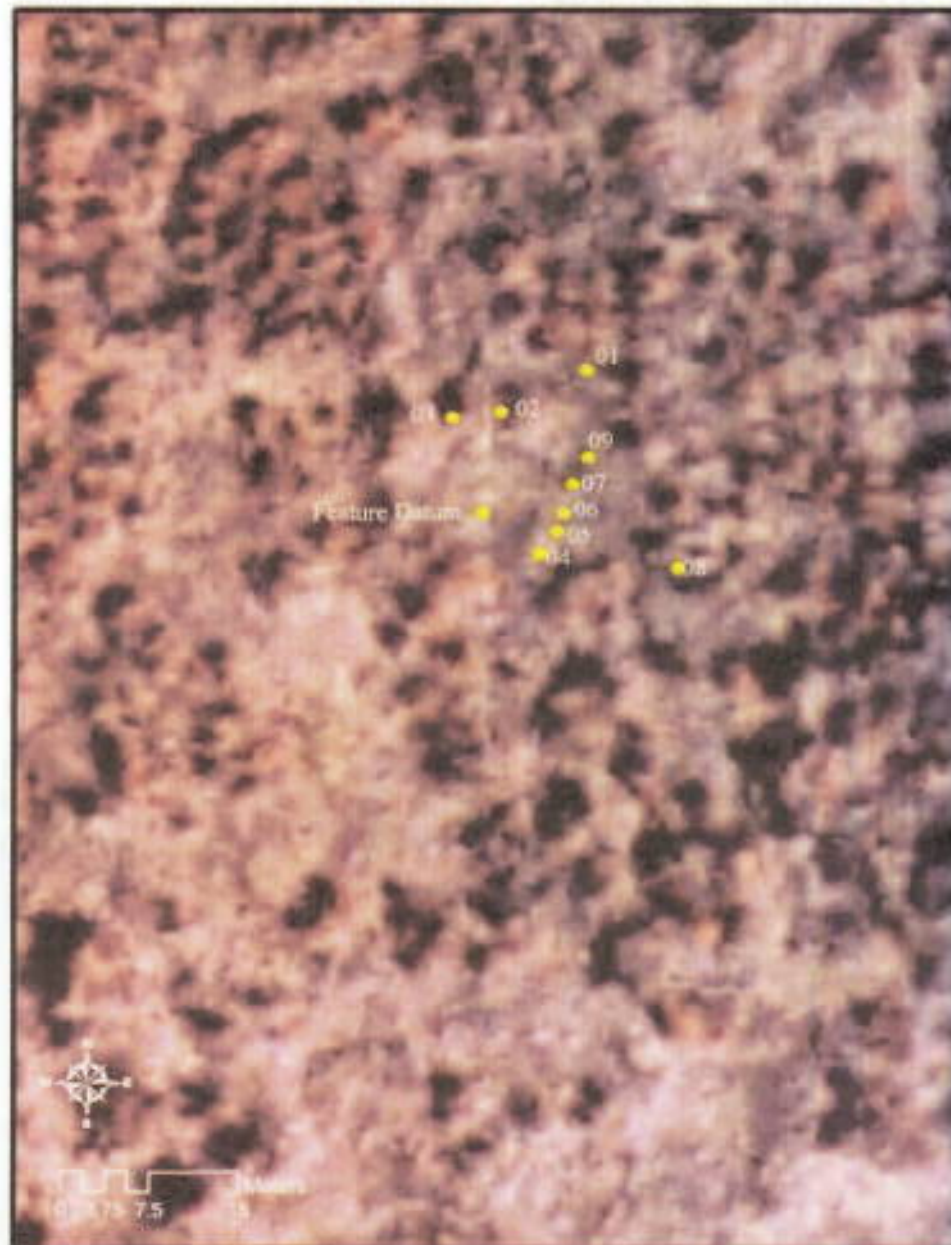


Figure 13. Site 23621 Feature 13 Plan Map

A previously undocumented cluster of excavated pits was located between feature 13 and feature 16. This cluster was assigned the temporary site number T-020107-01, and is referred to here as Feature 19. The cluster consisted of nine excavated pits extending over a 19 x 12 m area. The pits were on a relatively horizontal surface, immediately south of an 'a'ā ridge. This cluster of pits is outside of Range 11T and the SDZ.

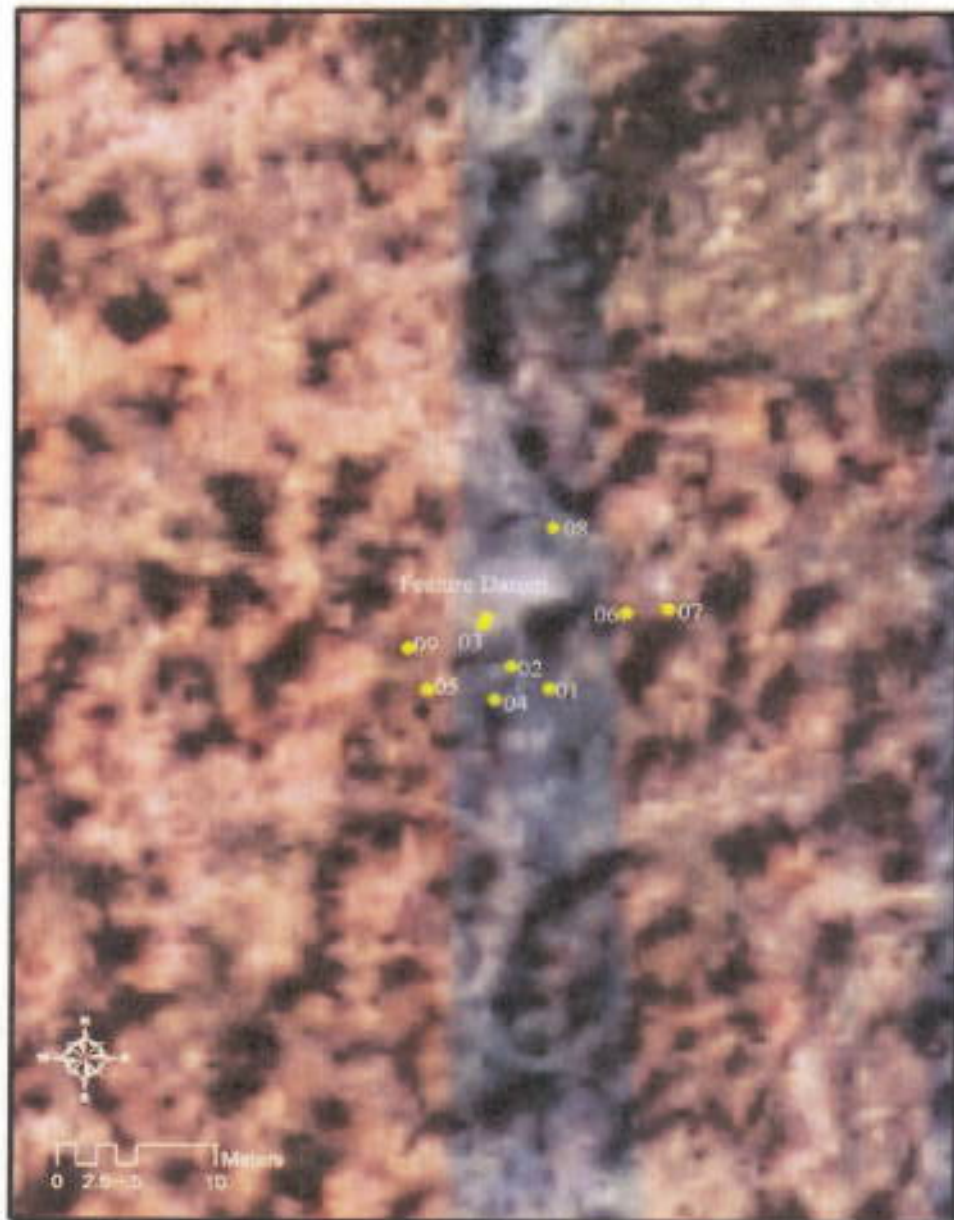


Figure 14. Site 23621 Feature 19 Plan Map

Feature 16 (GANDA #686) was identified by GANDA as a cluster consisting of 2 excavated pits. During the current project sixteen (16) excavated pits were documented, extending over a 78 x 23 m area. The cluster is to the south-southeast of a natural 'a'ā berm. Most of the pits are on a horizontal surface. This feature is located outside of Range 11T, but the western portion of this feature falls within the SDZ.

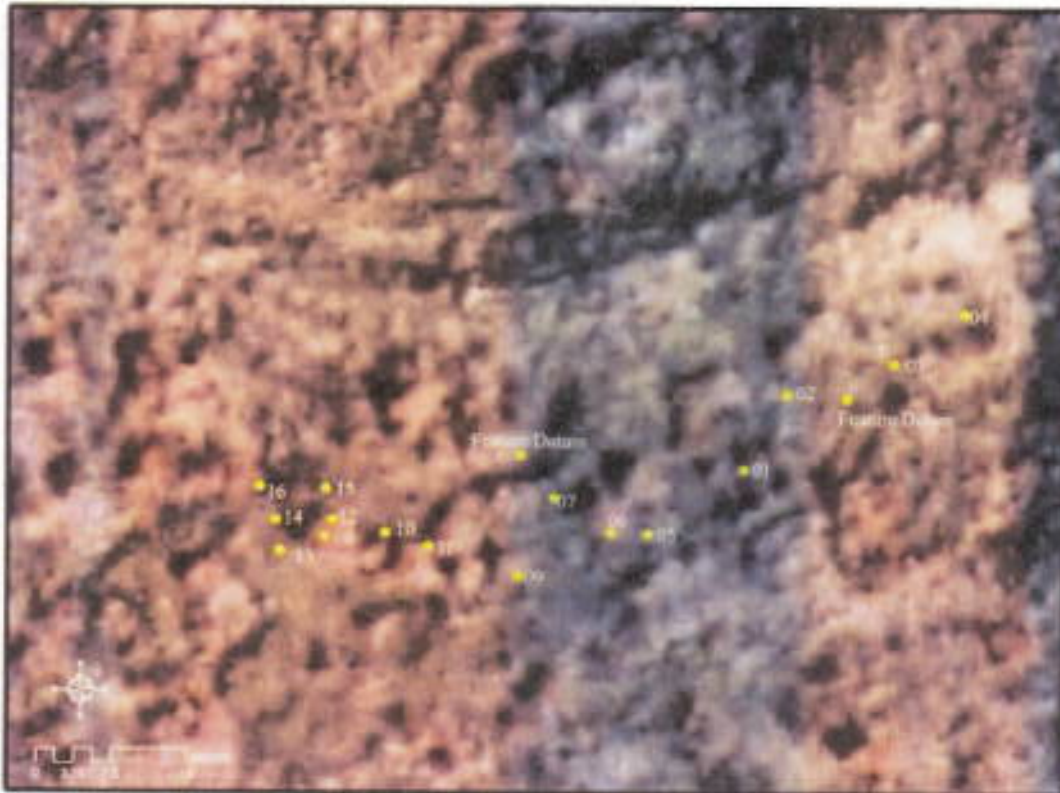


Figure 15. Site 23621 Feature 16 Plan Map

Feature 14 (GANDA #684) was reported by GANDA to contain 7 or more excavated pits. The current project identified eleven (11) excavated pits in a low area with the ground surface sloping upward to the east and northeast. The pits extend over an area that measures 35 x 12 m. The pits are largely located on a horizontal surface. A recent military feature was located close to the road, adjacent to some of the pits. This feature is located outside of Range 11T and the SDZ.

Feature 7 (GANDA #685) was recorded by GANDA in the field notes as including 2 excavated pits, and in the Robins & González 2006 report as including 10 excavated pits. The current project identified 4 excavated pits extending over a 15 x 8 m area. The feature is located on a small outcrop of bumpy pāhoehoe amid a predominantly 'a'ā flow. The entire available area was examined for excavated pits. The pits are on largely horizontal surfaces, with 'a'ā berms between this location and the proposed firing points. Feature 7 is outside of Range 11T and the SDZ.

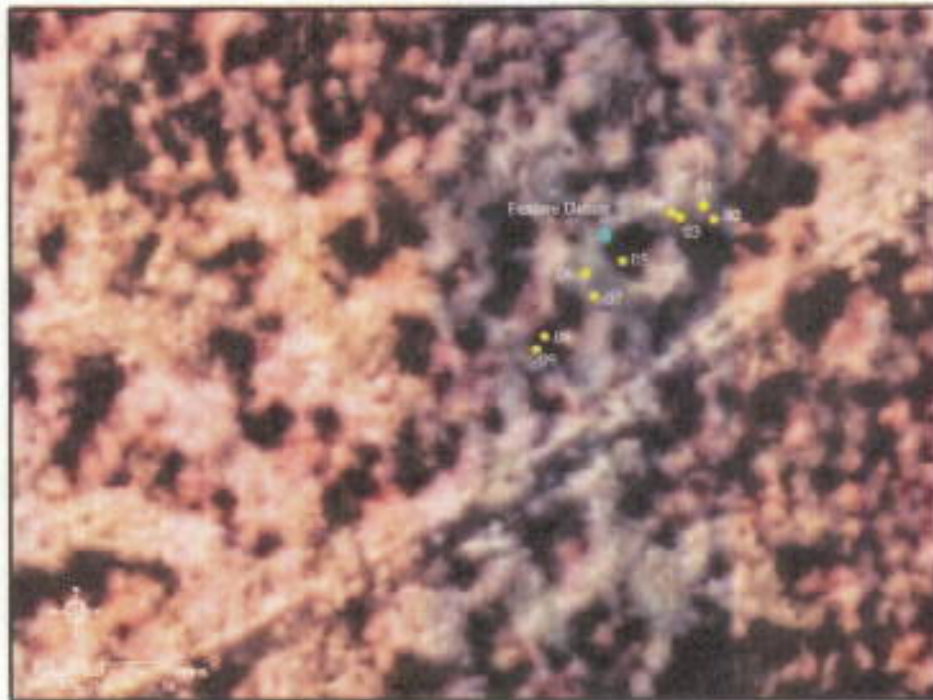


Figure 16: Site 23621 Feature 14 Plan Map

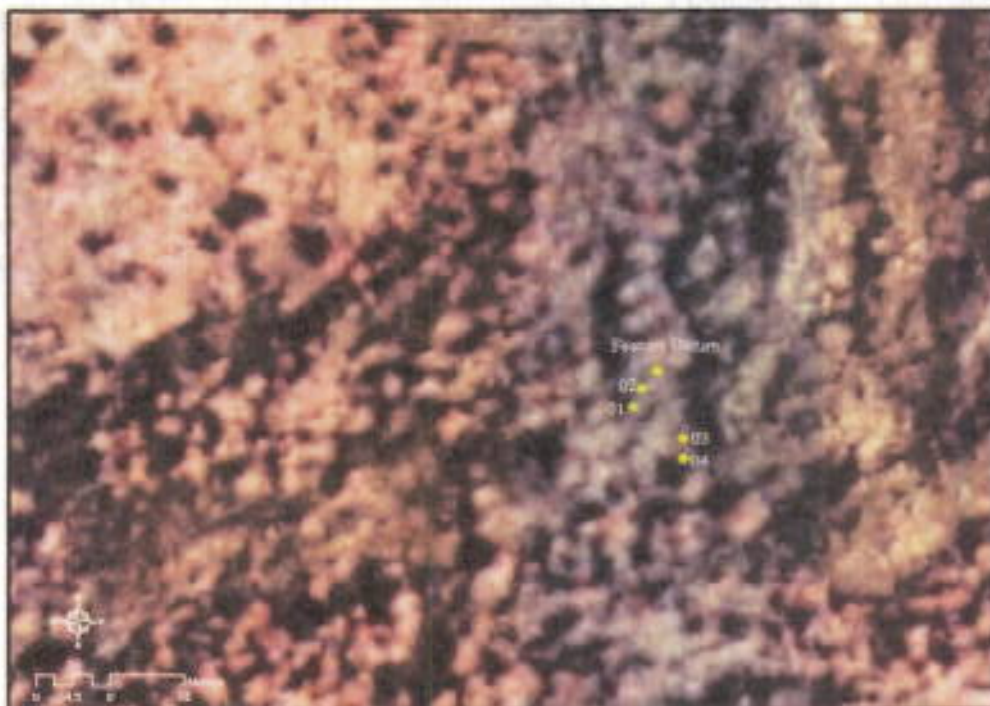


Figure 17: Site 23621 Feature 15 Plan Map

A previously unrecorded cluster of excavated pits was located to the east-southeast of feature 7. This cluster has been assigned feature number 20. Five (5) excavated pits were identified and recorded at this location extending over a 16 x 16 m area. The ground slopes downward to the southeast, and there are 'a'ā lava berms between this location and the proposed firing points. This cluster of pits is outside of Range 11T and the SDZ.

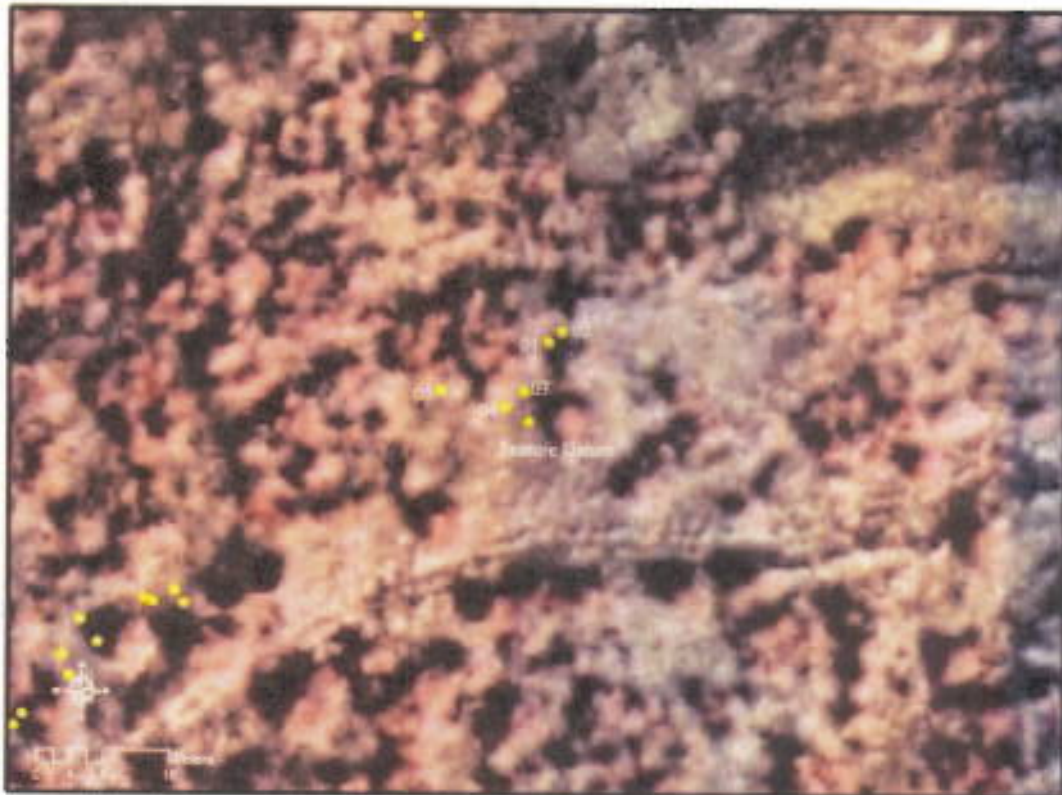


Figure 38. Site 23671 Feature 20 Plan Map

Feature 5 (GANDA #666) was described by GANDA field notes as consisting of 4 excavated pits, and by the Robins & González 2006 report as including 5. The current project identified three (3) excavated pits on horizontal ground in an 8 x 7 m area. At least one of the excavated pit areas was large enough that it could have been recorded as two separate pits, although the broken lava of the two connected to delineate one large area; during the current project we chose to record this as a single feature. Several 'a'ā ridges are located between this cluster and the proposed firing points. Feature 5 is located outside of Range 11T and the SDZ.

Feature 6 (GANDA #669) was reported by GANDA to include ten or more excavated pits. The current project identified and recorded twenty-six (26) excavated pits spread over a 64 x 32 m area. The pits over undulating, highly weathered pāhoehoe lava. Pits were located on horizontal and sloping surfaces. The area included natural collapse as well as features in which rocks had clearly been moved around, indicating human activity. There may be 'a'ā berms between this location and the proposed firing points. Feature 6 is outside of Range 11T and the SDZ.

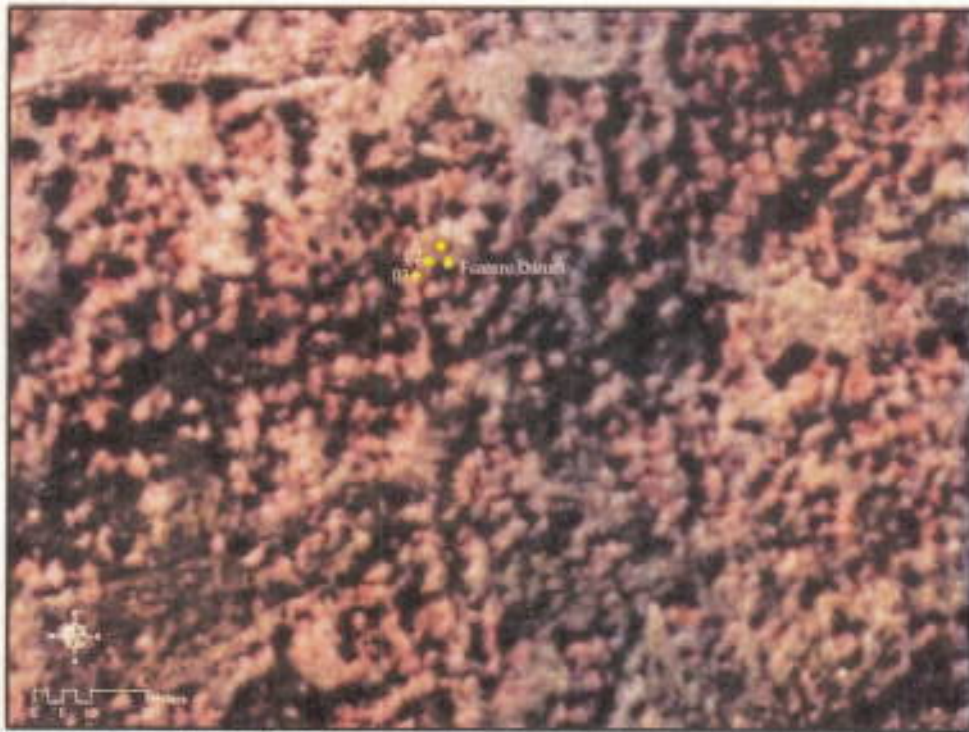


Figure 19. Site 23621 Feature 3 Plan Map

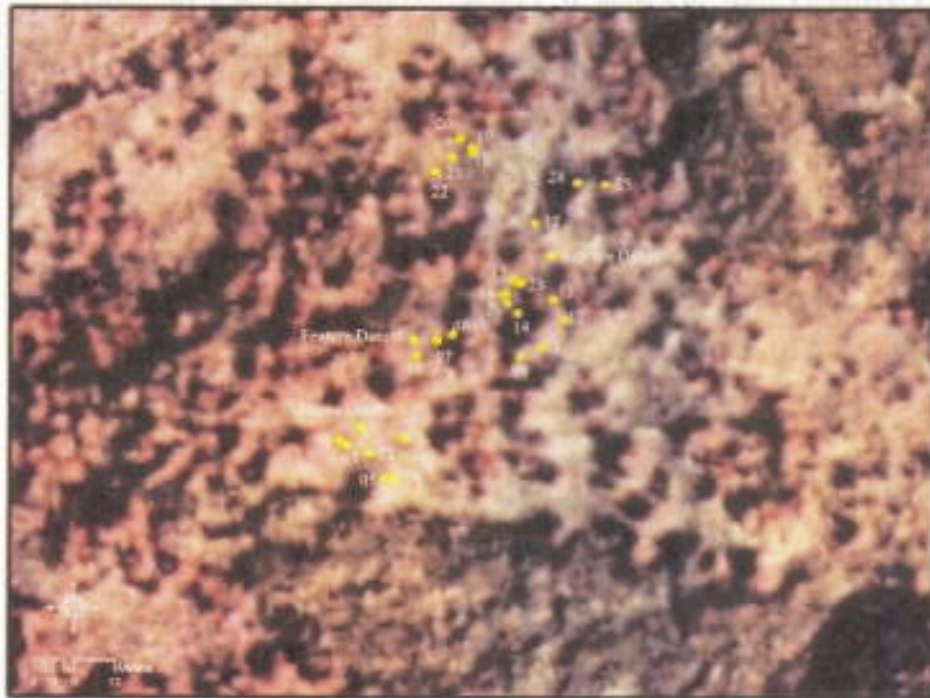


Figure 20. Site 23621 Feature 6 Plan Map

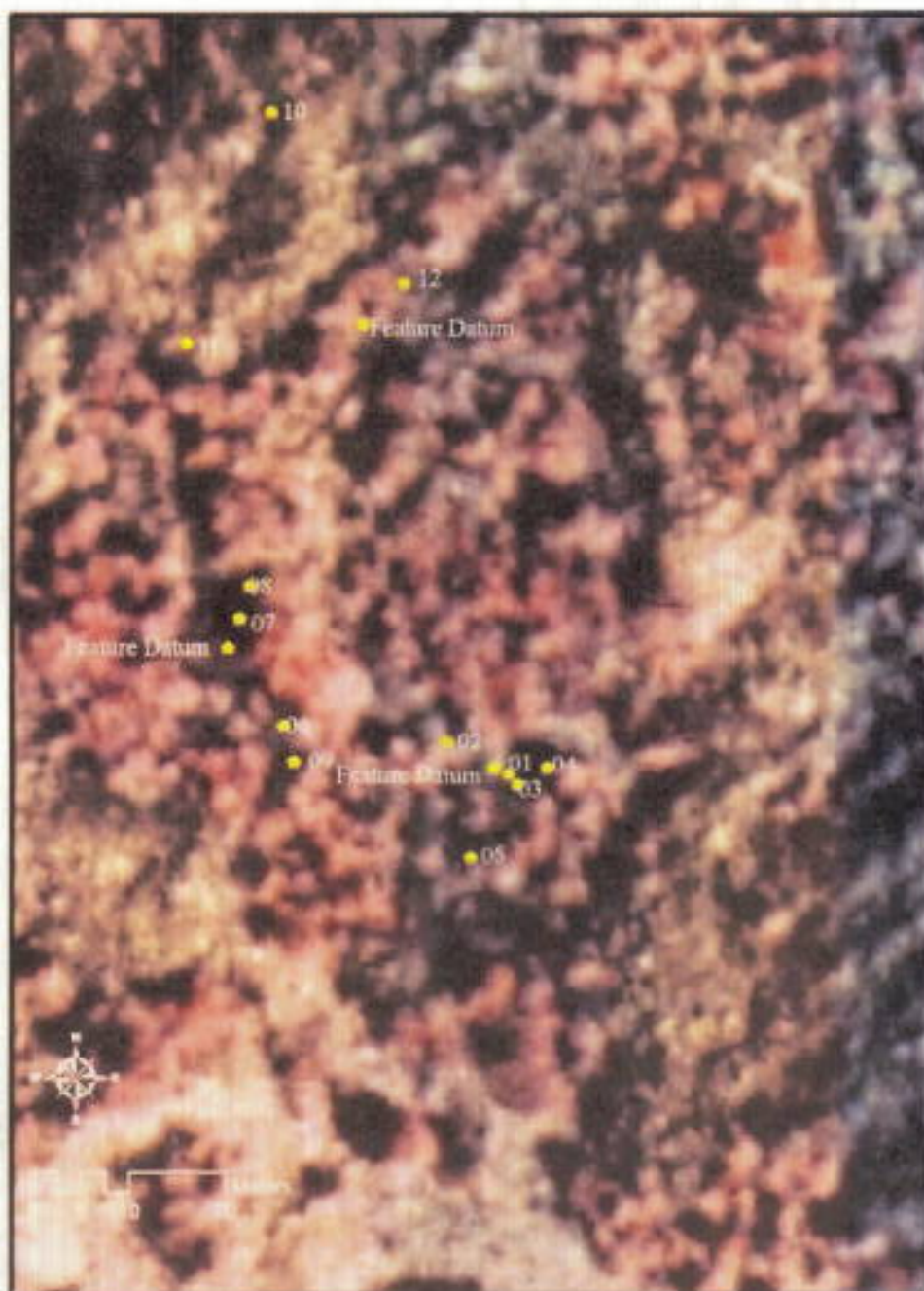


Figure 21. Site 23621 Feature 4 Plan Map

Feature 4 (GANDA #664) was described in the GANDA field notes as consisting of four or more excavated pits. The current project identified and recorded a cluster of twelve (12) excavated pits distributed over an area covering 70 x 68 m. The ground surface in the area is undulating, and

the pāhoehoe flow is in a low spot surrounded by 'a'ā ridges. The pāhoehoe appears to be naturally broken, and in some areas it appears that the naturally broken rocks were moved around. This was noted, but as the rock that had been moved does not form any clear structures they were not recorded. Feature 4 is located outside of Range 11T and the SDZ.

Several features that were at some point recorded as a part of this site are not discussed here. Time did not permit the relocation of one additional feature recorded by GANDA, feature 1 (GANDA # 657). This feature was described as consisting of a single excavated pit. An additional feature location, GANDA 665, was originally described in the GANDA field notes but does not appear in Table 11 of the GANDA report (Robins & González 2006: 68). The time frame devoted to the current project did not allow for an examination of this area to determine the presence or absence of excavated pits in this area. GANDA Site number 680, which appears in Table 11 (Robins & Gonzales 2006) as Fe. 11, was apparently at some point identified as Site 23464 and the subsequently discarded and included as part of Site 23626.

Conclusions

The Saddle region was probably significant for a limited range of purposes prior to European contact. Oral traditions and genealogies clearly indicate that the area and its major landmarks were significant to the culture and religion of Hawaiians as they feature in origin and creation stories, and at the beginning of genealogies (Maly & Maly 2005). Physical manifestations of this include the mountains, the *pu'u*, and the locations named in the various legends and genealogies.

Most of the districts of Hawai'i Island originate in the area between the mountains. It is possible that boundary markers of some type, including cairns, *heiau* or petroglyphs, might be present in boundary areas to designate them as such.

Oral traditions also make it clear that the Saddle region was traversed regularly via a series of interconnecting pathways. This travel was normally from one part of the island to another, one coastal region to another. An exception of this is the story of 'Umi-a-Liloa, who is said to have set up residence in the region between Mauna Loa and Hualalai. Trails would be the primary remains of this use of the region, though temporary habitation sites might also be present. Other site types related to this use of the Saddle region might include petroglyphs and cairns.

Resource procurement represented a significant use of the Saddle region in the pre-Contact era. Basalt was obtained from Mauna Kea, and other areas of fine-grained basalt quarries have been identified in the Saddle region. Volcanic glass was also quarried in the Saddle region, and these resources are distributed across the Saddle. Hawaiians also climbed the mountains to obtain birds for both feathers and foods. The *'ua'u* (dark-rumped petrel) nested in the area in the past, and the fledglings were delicacies reserved for the *ali'i*. Given both the distances and the environmental factors, the people who came to obtain these resources probably set up temporary habitation sites that were used for short periods of time, and possibly over consecutive years. Excavated pits, where the lava has been broken to expose voids beneath and rocks variously removed and sometimes replaced, have been associated in the archaeological literature with hunting for the *'ua'u*. Pits created in this context may either have been intended to create a habitat in which the birds would nest, or breaking open existing lava tubes to get to the birds. The historical literature indicates that the latter is less likely, as there is documentation of an alternative method for removing the fledglings from a burrow, using a long stick. Other suggestions have also been made for these pits, including sweet potato cultivation and volcanic glass (see Moniz Nakamura *et al.* 1998). It is probable that a similar site type – excavated pits – was in different areas the result of different activities.

The excavated pits that were documented during this project were excavated in areas of weathered pāhoehoe surrounded in most places by 'a'ā. Other archaeological sites within 1 km of Site 23621 include lava tubes used for habitation, trails, volcanic glass quarries to both the south and east, and other clusters of excavated pits. The following discussion of sites within a 1 km radius of Site 23621 provides some context for use of this area that may help to interpret past activities in the area of Site 23621, and therefore aid in the interpretation of function for these pits.

Site 23626 is within the boundaries of site 23621. The physical remains do not clearly indicate repeated use over a series of years. Charcoal samples were taken from an ash deposit that the excavators identified as possibly rakeout. The charcoal samples themselves were identified as possible burned roots; radiocarbon dates on the material both fell within the range of A.D. 1640-1950 at 2 σ . About 59 g of bird bone was recovered from this site, some volcanic glass flakes, a *kī* leaf sandal, several fire altered bird stones, one of which had been re-used as a hammerstone. Two 0.5 x 0.5 m units were excavated at this site, one in the south and one at the western side of the sink behind a wall. The stratigraphy varied between the two units, as did the physical remains (Shapiro & Cleghorn 1998; Robins & González 2006).

Site 19490 is a complex site composed of multiple features located to the north of Site 23621. The trail starts about 500 m from the closest feature of 23621, and the lava tube habitations are about 760 m from the closest feature of 23621. There are three lava blisters and one lava tube with physical remains inside, two trail segments, and *ahu*. Feature A lava blister contained scattered bird bone, volcanic glass, a firebrand, and a burned wooden pole, as well as a complete gourd adjacent to an upright stone slab, behind two stacked rocks at the end of one lava tube. This habitation site has not been excavated. Feature C lava tube contained extensive cultural material on the surface, including bird bones, gourd fragments, volcanic glass artifacts, vegetable matting, fire brands, charcoal, 'opihi shells, *kukui* nut fragments, and basalt artifacts. Concentration of bird bones and charcoal along the walls indicates efforts at clearing the floor of debris, and therefore probable re-use of the site for multiple habitation episodes. Excavation of a 1 x 1 m test unit at the entrance of the main tube uncovered multiple layers of ash deposits, as well as some heat affected basalt rocks that were likely used in an *imu*. Volcanic glass artifacts, basalt artifacts, mammal bone, fish bone, and sea and land bird bone, as well as egg shells, were recovered from the excavations. Stratigraphic provenance is not provided for the faunal material, and the artifacts are only quantified for one stratigraphic level, but the site appears to be a rich, well-used habitation site. Although the interpretation of the excavation was of an *imu*, given the relatively horizontal nature of the deposits and the layering this area may have been used to deposit ash and rocks from firepits, probably including *imu*. Stratigraphic locations for radiocarbon samples are not specified in the report (two excavation layers are given, with three samples in one layer). Two charcoal samples returned dates of A.D. 1450-1660 and 1480-1660, while the other two returned multiple intercepts within the date ranges between A.D. 1490 to 1950 and 1650 to 1950, respectively, at 2 σ confidence level. The latter three dates derived from the same, upper, stratigraphic layer. Feature D is a small blister shelter with bird bone and two volcanic glass fragments on the surface. Feature E is a small lava tube with an ash concentration and a volcanic glass blade on the floor surface, and a basalt hammerstone outside of the tube. One trail segment extends for about 250 m in an approximately northeast to southwest trending direction from the lava tubes. The other segment is oriented east and west, is visible from Feature A lava tube, and is evident for about 50 m. Three *ahu* are located on an 'a'ā ridge north of the lava tubes. Recent military debris is distributed throughout the site area (Shapiro & Cleghorn 1998; Robins & González 2006; Garcia & Associates n.d.).

Site 21308 is a blister shelter containing four pieces of bird bone 210 m southeast of Site 23621. No other artifacts were identified on the surface, and the site was not excavated (Roberts et al. 2004). Site 21309 is another lava tube habitation site nearby with one bird long bone in a

crevice, and a small amount of charcoal at the western end of the cave. This site is east of 21308 (Roberts et al. 2004). Site 21309 is about 400 m southeast of 23621.

A number of volcanic glass quarries are located around to the east and south of Site 23621. Site 21666 is a volcanic glass quarry complex covering 14.6 hectares and including 388 individual volcanic glass quarries. Some other features, such as *ahu* and caves, are associated with some of the quarries. The closest elements of this site (Features 104 and 197) are 810 and 1015 m from Site 23621 (Williams 2002; Roberts et al. 2004). Williams noted the presence of a possible excavated pit among the volcanic glass quarries, and that in some cases pahoehoe covered volcanic chill glass was excavated when nearby exposed volcanic chill glass was not quarried. Site 21672 is also volcanic chill glass quarry complex located 815 m southeast of Site 23621. Site 21672 covers an area 1175 m² and contains 9 individual quarry locations (Roberts et al. 2004). Site 21673 is a volcanic chill glass quarry located about 840 m southeast of site 23621, comprised of four individual quarry areas over an a 411 m² area (Williams 2002; Roberts et al. 2004). Site 21674 is a volcanic chill glass quarry site 570 m from 23621, covering an area of 62 m² and consisting of two quarried areas. Site 23545 is a volcanic glass quarry 290 m southeast of Site 23621, encompassing 180 m² and including three quarry locations, each of substantial size (32 m² to 101 m²). Site 23546 is 570 m southeast of Site 23621, encompasses 92.6 m², and includes five quarried areas (Roberts et al. 2004). Site 23458 is a volcanic glass quarry with elements about 300 m to the south of Site 23621. The site consists of 14 quarried areas extending over 6.6 hectares.

Elements of Site 23455 are about 830 m northeast of 23621. This is another complex of excavated pits, including more than 170 individual pits. This site includes some features to the west of the Range 11T project area as well. A bulk sediment sample was collected from Feature 8a of this site and analyzed. The results of the analysis of chemical elements, microflora, and microfauna did not show any physical evidence of avian nesting in this pit (Brown et al. 2006).

The excavated pits remain something of an enigma in Hawaiian archaeology. It is possible that the archaeological category "excavated pits" encompasses several functional categories that have resulted in similar remains. Some of the pits may have been the result of either creating habitat for nesting sea birds or seeking access to existing burrows. In some parts of the island some of these pits may have been used for sweet potato cultivation, as described in the ethnohistoric literature. It is unlikely in the setting of Range 11T that sweet potato cultivation took place, both because of the harsh climatic conditions and because of the distance from any regular habitation sites. The sediment analysis, though limited, also indicates that many of them may not have supported birds in a nesting setting. Egg shells have survived in some archaeological sites (19490), so if they were present and if the nesting birds were inclined to leave the shells in the nest following hatching, it is likely that these shells would have survived. In general, insufficient details are recorded about excavated pits during projects to distinguish variations among the pits.

The excavated pits examined for this project appear to be the remains of a search for something. In a number of cases it was clear that not only was an area with a void excavated, but adjoining areas with a lower layer of pāhoehoe were also pursued. In addition to bird nests, water and volcanic glass are other resources that might have been pursued. There are lava tubes in the vicinity of Site 23621, as discussed above, but water collection features have not been recorded in any of these. Gourd fragments were recorded at Site 19490.

In discussing volcanic chill glass quarries in the Red Leg Trail vicinity to the east of Site 23621, Williams noted that "in some areas the overlying pahoehoe was quarried to expose chill glass beneath the overlying surface" (2002: 69). The chill glass quarries are located within the k4 Mauna Loa volcanic flow, which dates to between 200 and 750 B.P. Most of the excavated pits in the area, both site 23621 and others, are on the older k2 flow (1500-3000 B.P.), and are adjacent to flows with volcanic glass quarries. Site 23621 lies in an area that is dominated by 'a'ā lava. The features of Site 23621 are found on restricted areas of pāhoehoe among the 'a'ā. If the excavated

pits in this area were indeed the result of a search for volcanic glass, it may have been a prospecting type of search and volcanic glass was not necessarily found. Roberts et al. (2004) note one excavated pit that contained volcanic glass flakes (feature 138 of Site 23455).

The foregoing discussion is intended to point out some of the possible activities that could have resulted in the production of the excavated pits. Further research that could help to answer questions about the past use of these pits would include expansion of the analysis of sediments from a larger sample of pits, development of a better understanding of quarrying techniques for volcanic glass to allow comparison with activities in the areas of excavated pits. In the interest of time this project did not map individual pits and the locations of rocks in and around them; such a project might provide useful information about variation between pits, and similarities and differences with areas in which volcanic glass was quarried.

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Appendix A. Excavated Pit Data

Excavated Pits

Fea. No.	GANDA ID	Pit No.	Length (m)	Width (m)	Depth (m)	Floor Character	Shape	Rock Locations
18	688	1	2.40	2.35	0.45	Pahoehoe, cobbles, pebbles & soil	Oblong	Both
18	688	2	0.70	0.50	0.30	Cobbles, pebbles & soil	Circular	Both
18	688	3	1.50	1.30	0.35	Pahoehoe, cobbles, pebbles & soil	Circular	Both
18	688	4	1.10	1.00	0.25	Pahoehoe, cobbles, pebbles & soil	Circular	Both
18	688	5	1.80	1.00	0.53	Cobbles & Pebbles	Oblong	Both
18	688	6	0.80	0.60	0.30	Cobbles & Pebbles	Irregular	Both
18	688	7	1.50	1.00	n/a	Pahoehoe, cobbles, pebbles & soil	Irregular	Both
17	687	1	1.50	0.75	0.30	Pahoehoe, cobbles, pebbles & soil	Oval	Both
17	687	2	1.30	1.00	0.25	Cobbles, pebbles & soil	Irregular	Both
15	682	1	0.90	0.65	0.47	Pahoehoe, cobbles, pebbles & soil	Irregular	External
15	682	2	1.60	1.50	0.50	Pahoehoe, cobbles, pebbles & soil	Irregular	Both
8	678	5	0.70	0.40	0.35	Cobbles, pebbles & soil	Triangular	Both
8	678	6	0.90	0.40	0.25	Unknown	Linear	External
8	678	3	2.00	0.80	0.36	Cobbles, pebbles & soil	Oblong/Linear	Both
8	678	4	0.70	0.50	0.25	Cobbles, pebbles & soil	Irregular	Both
8	678	1	2.10	2.00	0.30	Cobbles, pebbles & soil	Round	Both
8	678	2	0.90	0.75	0.36	Cobbles, pebbles & soil	Round	Both
8	678	7	0.90	0.80	0.34	Unknown	Triangle	Both
2	658	2	1.30	1.07	0.40	Unknown	Oval	External
2	658	3	0.80	0.70	0.10	Cobbles, pebbles & soil	Round	Internal
2	658	1	2.20	0.70	0.47	Pahoehoe, cobbles, pebbles & soil	Irregular (like glasses)	Both
3	659	5	2.60	0.97	0.30	Cobbles and Pebbles	Rectangular	Both
3	659	18	4.00	0.80	0.30	Cobbles, pebbles & soil	Kidney bean	Both
3	659	1	5.10	2.30	0.30	Cobbles, pebbles & soil	Irregular	Both
3	659	16	2.20	1.30	0.30	Cobbles, pebbles & soil	Irregular	Both
3	659	17	1.10	0.80	0.50	Pahoehoe, cobbles & pebbles	Oblong	Both
3	659	4	2.70	1.30	0.25	Pahoehoe, cobbles, pebbles & soil	Pear shaped	Both

3	659	9	1.65	1.30	0.35	soil	Irregular	Both
3	659	13	0.85	0.60	0.30	Cobbles, pebbles & soil	Oval	Both
3	659	12	0.95	0.85	0.30	Cobbles & Pebbles	Irregular	Both
3	659	10	2.00	1.25	0.25	Cobbles, pebbles & soil	Trapezoidal	External
3	659	8	1.20	0.80	0.55	Unknown	Irregular	External
3	659	11	3.80	1.30	0.30	Cobbles, pebbles & soil	Oblong	Both
3	658	4	0.30	0.30	n/a	Cobbles & Pebbles	Diamond	Both
3	659	6	1.50	1.00	0.25	Soil	Oblong	External
3	659	14	3.90	1.50	0.40	Cobbles, pebbles & soil	Triangular with tail	Both
3	659	3	1.05	0.75	0.35	Soil	Oval	External
10	679	1	1.30	1.20	0.53	Cobbles, pebbles & soil	3/4 circle	External
10	679	2	0.85	0.60	0.70	Cobbles, pebbles & soil	Triangular	Both
9	681	1	1.33	1.15	0.40	Cobbles, pebbles & soil	Diamond	Both
9	681	2	1.00	0.80	0.25	Cobbles, pebbles & soil	irregular	Both, mostly internal
9	681	3	0.16	0.10	0.20	Pahoehoe & soil	Triangular	External
13	683	3	0.52	0.30	0.50	Pahoehoe & soil	Trapezoidal	External
13	683	4	2.50	0.70	0.30	Cobbles, pebbles & soil	Oblong, double pit	Both
13	683	5	0.90	0.50	0.35	Cobbles, pebbles & soil	n/a	Both
13	683	7	1.20	0.75	0.30	Cobbles, pebbles & soil	Oblong, irregular	Both
13	683	9	2.10	1.10	0.30	Pahoehoe, cobbles, pebbles & soil	Oblong	Both
13	683	8	1.55	1.50	0.40	Cobbles & pebbles	circular	Both
13	683	6	2.00	0.90	0.40	Cobbles, pebbles & soil	Oblong, irregular	Both
13	683	2	0.58	0.55	0.40	Pahoehoe, cobbles, pebbles & soil	Rounded square	Both
13	683	1	2.40	1.10	0.40	Pahoehoe, cobbles, pebbles & soil	Irregular	Both
16	686	16	1.30	1.10	0.35	Pahoehoe, cobbles, pebbles & soil	Triangular	Both
16	686	13	1.50	1.30	0.40	Pahoehoe, cobbles, pebbles & soil	n/a	Both
16	686	14	1.10	0.75	0.30	Pahoehoe, cobbles, pebbles & soil	Irregular	Both
16	686	15	0.80	0.45	0.30	Cobbles, pebbles & soil	Round	Both
16	686	11	3.00	1.40	0.40	Pahoehoe, cobbles, pebbles & soil	Rectangular	Both
16	686	10	1.10	0.60	0.30	Cobbles & pebbles	Small elongated oval	Both

16	686	12	0.85	0.55	0.20	Cobbles & pebbles	Irregular	Both
16	686	8	0.65	0.50	0.30	Cobbles, pebbles & soil	Triangular	Both
16	686	9	1.50	0.75	0.10	Pahoehoe, cobbles, pebbles & soil	Rectangular	Both, mostly external
16	686	7	2.60	1.80	0.25	Pahoehoe, cobbles, pebbles & soil	Irregular, hard to see	Both
16	686	5	3.40	0.75	0.40	Pahoehoe, cobbles, pebbles & soil	Oblong	Both
16	686	6	2.10	1.10	0.35	Pahoehoe, cobbles, pebbles & soil	Oblong	Both
16	686	1	2.40	1.10	0.44	Pahoehoe, cobbles, pebbles & soil	Irregular	Both
16	686	4	0.35	0.30	0.50	Cobbles, pebbles & soil	Circular	Internal
16	686	2	3.10	1.40	0.35	Cobbles, pebbles & soil	Round with extension	Both
16	686	3	4.00	1.30	0.30	Pahoehoe, cobbles, pebbles & soil	Irregular	Both
14	684	10	2.00	1.40	0.15	Cobbles	Irregular	Both
14	684	9	1.00	1.00	n/a	Cobbles & pebbles	Trapezoidal	Both
14	684	7	1.70	1.10	0.25	Pahoehoe, cobbles, pebbles & soil	Oval	Both
14	684	5	1.30	0.75	0.25	Pahoehoe, cobbles, pebbles & soil	Rectangular	Internal
14	684	8	1.60	1.00	0.25	Pahoehoe & cobbles	Oval	Internal
14	684	3	1.30	0.80	0.30	Pahoehoe & cobbles	Triangular	Both
14	684	4a	1.60	0.50	0.20	Cobbles & pebbles	Rectangular	Internal
14	684	1	1.10	1.10	0.35	Pahoehoe, cobbles, pebbles & soil	Irregular circle	Both
14	684	2	2.00	1.70	0.40	Cobbles, pebbles & soil	circular	Both
14	684	4	1.40	1.40	0.35	Pahoehoe, cobbles, pebbles & soil	Trapezoidal	Both
14	684	6	2.50	0.80	0.15	Pahoehoe, cobbles, pebbles & soil	Oblong	Both
7	685	2	1.10	0.50	0.40	Pahoehoe, cobbles & pebbles	Triangular	Both
7	685	1	2.00	0.90	0.30	Pahoehoe, cobbles, pebbles & soil	Irregular	Both
7	685	3	0.50	0.50	0.15	Soil and 'a'a	irregular	Both
7	685	4	1.30	0.85	0.90	Pahoehoe, cobbles, pebbles & soil	irregular	Both
5	666	1	1.30	0.70	0.50	Pahoehoe, cobbles, pebbles & soil	oval	Both

5	666	2	0.60	0.60	0.50	Pahoehoe & cobbles/pebbles	Irregular	Both
5	666	3	2.30	1.60	0.60	Pahoehoe, cobbles, pebbles & soil	Irregular	Both
6	669	1	1.30	0.90	0.60	Cobbles, pebbles & soil	Irregular	Both, mostly external
6	669	4	0.17	0.14	n/a	Pebbles & soil	square	External
6	669	5	0.50	0.50	0.20	Pahoehoe, cobbles, pebbles & soil	Half circle	Both
6	669	2	0.50	0.40	0.00	Cobbles & pebbles	n/a	Both, mostly internal
6	669	3	2.00	0.40	0.40	Cobbles, pebbles & soil	Irregular	Both
6	669	6	1.00	1.00	n/a	Cobbles & pebbles	Irregular	Internal
4	664	1	0.90	0.60	0.50	Pahoehoe, cobbles, pebbles & soil	Irregular	Both
4	664	6	2.70	1.30	0.30	Pahoehoe, cobbles & pebbles	Irregular	Both
4	664	8	1.40	0.70	0.50	Cobbles, pebbles & soil	Rectangular	Both
4	664	7	0.80	0.80	0.50	Cobbles, pebbles & soil	L-shaped	Both
4	664	9	1.30	0.60	0.65	Cobbles, pebbles & soil	Irregular	Both
4	664	4	0.60	0.20	0.50	Soil	Irregular	n/a
4	664	5	1.90	1.90	1.25	Cobbles & pebbles	Roughly circular	Both
4	664	2	1.70	0.90	0.40	Pahoehoe, cobbles, pebbles & soil	Edge of lava	Both
4	664	3	1.80	1.20	0.30	Pahoehoe, cobbles, pebbles & soil	Edge of lava, linear	Both
4	664	12	1.60	1.50	0.12	Pahoehoe & soil	Circular	Both
4	664	11	1.00	0.80	0.10	Cobbles, pebbles & soil	Rectangular	Internal
4	664	10	1.20	1.00	0.60	Pahoehoe, cobbles, pebbles & soil	Irregular	Both
6	669	25	0.50	0.45	0.40	Plant material	Triangular	Internal
6	669	26	1.70	0.70	0.40	Pahoehoe, cobbles, pebbles & soil	Bent Rectangle	Both
6	669	20	1.90	1.60	0.40	Pahoehoe, cobbles, pebbles & soil	Circular	Both
6	669	21	0.75	0.40	0.20	Cobbles & Pebbles	circular	Both
6	669	18	2.90	1.40	0.37	n/a	Oval	Internal
6	669	19	1.04	0.80	0.37	Pahoehoe, cobbles, pebbles & soil	n/a	Both
6	669	24	1.20	1.00	0.40	Cobbles & Pebbles	Rectangular	Both
6	669	22	1.08	1.00	0.30	Pahoehoe, cobbles, pebbles & soil	Elongated Oval	Both
6	669	16	1.20	0.40	0.30	Cobbles, pebbles & soil	n/a	Both

6	669	17	3.90	1.30	0.10	Pahoehoe, cobbles, pebbles & soil	Rectangular	Both
6	669	15	0.70	0.40	0.50	Pahoehoe, cobbles, pebbles & soil	Irregular	External
6	669	23	1.00	0.90	0.20	Cobbles, pebbles & soil	Flattened circle	Both
6	669	11	0.80	0.50	0.15	Pahoehoe, cobbles, pebbles & soil	Irregular	Both
6	669	12	1.20	0.50	0.20	Pahoehoe, cobbles, pebbles & soil	Rectangular	Both
6	669	13	1.70	1.00	0.35	Cobbles, pebbles & soil	Oblong	Both
6	669	14	2.20	0.75	0.30	Pahoehoe, cobbles, pebbles & soil		Internal
6	669	10	0.55	0.30	0.05	Soil	Oblong	Unknown
6	669	9	1.20	1.20	0.35	Cobbles, pebbles & soil	circular	Both
6	669	8	0.15	0.10	0.25	Pahoehoe & soil	Triangle	Both
6	669	7	1.25	0.95	0.35	Cobbles, pebbles & soil	Rounded Triangle	Both
T- 020207- 01	1	0.62	0.50	0.40	Cobbles, pebbles & soil	circular		External
T- 020207- 01	2	0.40	0.20	0.40	not recorded	irregular		external
T- 020107- 01	6	0.63	0.55	0.40	Pahoehoe, cobbles, pebbles & soil	Oval		Both
T- 020107- 01	7	1.45	0.90	0.45	Pahoehoe & cobbles	Triangular, base open		Both
T- 020107- 01	5	1.40	1.00	0.25	Pahoehoe, cobbles, pebbles & soil	irregular		Both
T- 020107- 01	9	1.40	0.90	n/a	Pahoehoe, cobbles, pebbles & soil	irregular		Both
T- 020107- 01	3	0.94	0.80	0.20	Cobbles, pebbles & soil	Half circle		Both

T-020107-01	4	0.70	0.60	0.25	Pahoehoe, cobbles, pebbles & soil	Square	Both
T-020107-01	1	2.10	1.70	0.50	Cobbles, pebbles & soil	Round	both
T-020107-01	2	2.60	2.15	0.30	Pahoehoe, cobbles, pebbles & soil	irregular	Both
T-020207-01	1	0.80	0.45	0.28	Pahoehoe	Rounded Triangle	External
T-020207-01	3	1.75	0.80	0.30	Cobbles, pebbles & soil	Oblong	Both
T-020207-01	4	1.30	0.80	0.35	Pahoehoe, cobbles, pebbles & soil	Irregular	Both